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## ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

## A Cultural Control Method for Pinyon Needle Scale

Harold W. Flake, Jr.<sup>1</sup> and Daniel T. Jennings<sup>2</sup>

Describes a simple, inexpensive cultural control method for pinyon needle scale by washing eggs off host trees. Dislodged eggs, litter, and debris are raked, bagged, and destroyed. Control must be timed to coincide with the egg stage before crawler emergence.

**Keywords:** Cultural control, pinyon needle scale, pinyon, *Matsucoccus acalyptus*, *Pinus edulis*.

The pinyon needle scale, *Matsucoccus acalyptus* Herbert, is a serious pest of pinyon, *Pinus edulis* Engelm., in the Southwest. Heavily infested trees are characterized by a yellowing or browning of the foliage, reduced needle length, and premature needle drop. Foliage of trees damaged for several years is chlorotic and thin (fig. 1). Pinyons may be killed by repeated infestations of this insect. Also, trees weakened by repeated scale feeding are subject to killing attacks by secondary insects such as bark beetles. Scale damage is of greatest importance in urban and high-use recreational areas where esthetic values are impaired.

McCambridge and Pierce (1964) determined the life history of the pinyon needle scale in Arizona and Colorado. The life history is summarized as follows: Wingless females emerge in early April from overwintering immobile in-



<sup>1</sup>Entomologist, Division of Timber Management, U.S. Forest Service, Southwestern Region, Albuquerque, New Mexico 87103. Present address: Division of State and Private Forestry, U.S. Forest Service, Northern Region, Missoula, Montana 59801.

<sup>2</sup>Research Entomologist, located at Station's Research Work Unit at Albuquerque, in cooperation with the University of New Mexico; Station's central headquarters is maintained at Fort Collins, in cooperation with Colorado State University.

Figure 1.—Pinyon defoliated by the pinyon needle scale.

dividuals on the needles. As the females emerge, they are mated by winged males. Mated females lay eggs in late April in bark fissures and under bark scales of three favored sites on pinyon — (1) around the root collar, (2) in the crotches of larger branches, and (3) along the undersides of large branches (fig. 2). The



Figure 2.—Cottony egg masses on branches and around root collar.

Figure 3.—Immobile scales on year-old needles.



yellow eggs are deposited in oval clusters held together by white "cottony" webbing. In about 4 weeks, red eye spots are visible in developing eggs under low magnification. The young, mobile crawlers emerge 7 to 10 days after the eye spots appear.

The crawlers migrate to year-old needles where they become immobile, and start to feed (fig. 3) by inserting stylets into the needle and sucking sap from the needle tissues. The immobile scales secrete a hard, waxy, protective covering. Feeding continues through the summer months, and by fall, mobile males begin to emerge from some of the immobile scales. Male emergence continues during warmer winter periods and in early spring. Female scales remain immobile and spend the winter as second-instar nymphs on the needles. Males emerging in fall and winter crawl down the tree from the needles and spin loose, white silken webs in sheltered places under stones, twigs, or in the litter. Winged males emerge from these webbings in April and mate with emerging females on the needles, thus completing one generation per year.

Only during the egg stage are both male and female scales highly concentrated for a short time, providing a potentially favorable situation for direct control (Pierce et al. 1968). Insecticide tests during egg hatch, and before complete dispersal of crawlers, showed that a water emulsion of 0.5% dimethoate was effective (Pierce et al. 1968). Dimethoate has been successfully used on an operational basis for controlling pinyon needle scale in scenic and recreational areas of the Southwest, and is currently registered for such use. Our Note describes an alternate method for reducing scale populations on individual trees in situations where insecticide use may be prohibited or undesirable.

## Methods

We tested our washing method on May 29-30, 1973, when scales were in the egg stage. Five groups of infested trees were selected on the grounds of the Headquarters, Southwest Region, National Park Service, Santa Fe, New Mexico. In each group, three trees of like form and infestation levels were marked. Trees ranged from 5 to 9 ft in height. One of three treatment categories was randomly assigned to each tree in each group. Treatments were: (1) Egg masses were washed from large branches and lower bole of the tree. Litter, egg masses, and debris were then raked and removed from an area equal to the circumference of the tree crown. (2) Same as treatment one, with addition of a 3-inch

band of Tanglefoot<sup>3</sup> at the base of the washed tree bole to prevent any crawlers on the ground from climbing into the tree crown. (3) Untreated check.

Egg masses were washed from the trees with a 3/4-inch hose equipped with an adjustable garden-hose nozzle to simulate equipment available to homeowners. Water was supplied by a 250-gal capacity fire pumper tank at 30 to 35 pounds pressure. Twenty to forty gallons of water were used for each tree.

Some low branches had to be pruned so the ground under the trees could be raked in treatments one and two. Litter, egg masses, and other debris raked from under the treated trees were placed in plastic bags and destroyed.

In late July, after egg hatch and crawler dispersal, the test trees were evaluated to determine scale populations on check and treated trees. Twenty-five two-needle fascicles were randomly picked from midcrown levels of each tree, and live scales on each needle were counted under a microscope.

## Results

An analysis of variance of the posttreatment scale populations indicated significant differences between treatment and check means. Further analysis with Duncan's (1955) multiple range test showed no significant difference be-

tween treatment 1 (without) and treatment 2 (with Tanglefoot band), thus indicating the band was not necessary for effective control. Mean scale populations per 25 two-needle fascicles were 1.64 and 1.90 for treatments 1 and 2, respectively, while check trees had 11.80. Scale populations were thus reduced 86 and 84 percent for treatments 1 and 2, compared to check trees. These reductions were sufficient to protect the appearance of the trees. The Tanglefoot band did not improve the control obtained by washing alone.

## Control Procedure

Proper timing of the washing treatment is critical. Washing will be effective only when the insects are in the egg stage, before crawlers emerge and disperse. In the Southwest, the eggs are usually susceptible from the middle of May through the first week of June. The egg stage can readily be detected by the "cottony" webbing around the root collar, in the branch crotches, and on the undersides of large branches (see fig. 2). Small trees (up to 4 ft in height) may not exhibit the "cottony" webbing, but adjacent larger trees are usually good indicators that treatment may be necessary. Needles of small trees devoid of "cottony" webbing should be checked for signs of scale infestations (see fig. 3).

Wash the tree trunk and all branches with a garden hose equipped with an adjustable nozzle (fig. 4). Eggs are easily washed from laying sites with a moderate water stream and pressure. For good control, it is important to thoroughly wash the tree trunk, branch crotches, and undersides

Figure 4.—Washing pinyon branches and trunk to remove eggs.



of all branches. Inspect these egg-laying sites to determine if the eggs have been dislodged.

Eggs and other debris must be removed from the tree base and destroyed. The wet litter and eggs at the base may be allowed to dry for 1 or 2 days to facilitate removal, but they must be removed before eggs hatch. Rake all litter from an area around the tree base equal to the circumference of the tree crown. All eggs and debris should be bagged and destroyed to prevent reinestation of the original or surrounding trees (fig. 5).

The washing and removal-of-debris method is a simple, inexpensive, and effective cultural control procedure that offers an alternative to chemical pesticides.

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Figure 5.—Bagging litter, egg masses, and debris for removal and disposal.